SUMMARY MINUTES

OF THE

EAR, NOSE AND THROAT DEVICES PANEL MEETING

Open Session

August 16, 2002
Gaithersburg Holiday Inn
Gaithersburg, MD

EAR, NOSE AND THROAT DEVICES PANEL MEETING

AUGUST 16, 2002

PANEL PARTICIPANTS

A. Julianna Gulya, M.D.	Chair
Howard Francis, M.D.	Voting Member
Herman A. Jenkins, M.D.	Voting Member
Paul R. Kileny, Ph.D.	Voting Member
Linda J. Hood, Ph.D.	Voting Member
Sigfrid D. Soli, Ph.D.	Voting Member
Debara L. Tucci, M.D.	Voting Member
Brent A. Blumenstein, Ph.D.	Consultant
Roberto A. Cueva, M.D.	Consultant
Brenda L. Lonsbury-Martin, Ph.D.	Consultant
Donald K. Eddington, Ph.D.	Consultant
Joseph W. Hall, Ph.D.	Consultant
Brian E. Walden, Ph.D.	Consultant
Catalina E. Garcia, M.D.	Consumer Representative
R. Michael Crompton, J.D., M.P.H., R.A.C	Industry Representative

FDA PARTICIPANTS

Sara M. Thornton	Panel Executive Secretary
David M. Whipple	Deputy Director, Division of Ophthalmic and Ear, Nose and Throat Devices
Eric A. Mann, M.D., Ph.D.	Chief, Ear, Nose and Throat Devices Branch
Teri M. Cygnarowicz, M.A., CCC-A	Audiologist, Ear, Nose and Throat Devices Branch

CALL TO ORDER

Panel Chair Julianna Gulya, M.D., called the meeting to order at 12:42 p.m. **Panel Executive Secretary Sara Thornton** announced the confirmation of Dr. Gulya as panel chair and the appointment of four new voting members: Drs. Linda Hood, Herman Jenkins, Sigfrid Soli, and Debara Tucci. Dr. Catalina Garcia has been appointed consumer representative, and Mr. Michael Crompton is the new industry representative. Ms. Thornton then read the conflict of interest statement. A waiver had been granted to Dr. Soli for his financial interests in a firm at issue that could be affected by the panel's recommendations, and his full participation was permitted. The Agency also took into consideration other matters concerning Dr. Soli that were unrelated to the day's agenda.

OPEN PUBLIC HEARING

Christopher W. Turner, Ph.D., Professor of Speech and Audiology, University of Iowa, and **consultant for St. Croix** presented information on evaluation of implantable hearing devices. The Envoy system is totally implantable—the eardrum is used as a microphone, and the entire device is under the skin. The patient carries a remote control device to adjust the volume.. The St. Croix device is the first totally implantable device, and it has the potential to offer benefits beyond typical laboratory measures. In evaluating the effectiveness of the device, it is important to consider quality-of-life (QOL) measures.

Panel Questions

The panel asked many questions concerning QOL measures and how to address the issue in studies. They also asked questions about technical aspects of the St. Croix device and how to measure its performance. Dr. Turner indicated that he is not an expert on QOL measures, but

examining patient self-image and ability to perform activities of daily living might be a good start. In response to a question concerning how to measure the effectiveness of the device, he suggested that because it was not possible to measure gain directly, it would be necessary to look at functional gain.

OPEN COMMITTEE DISCUSSION

Division Update

David M. Whipple, Deputy Director, Division of Ophthalmic and Ear, Nose and Throat Devices, noted some personnel changes at the Agency and introduced Dr. Eric Mann, the new chief of the Ear, Nose and Throat Devices Branch.

Branch Update

Eric A. Mann, M.D., Ph.D., Chief, Ear, Nose and Throat Devices Branch, updated the panel on the Branch's activities. He listed the names of branch personnel and then reviewed the approvals for implantable middle ear hearing devices (IMEHDs). In August 2000, FDA approved the Vibrant Soundbridge System, in accordance with the Panel's recommendations; the device is intended to provide a useful level of sound perception through mechanical stimulation of the ossicles. Dr. Mann described how the device works and noted that it is indicated for adults with moderate to severe sensorineural hearing loss who have experience with appropriately fit conventional hearing aids. In September 2001, FDA approved a similar IMHED, the Soundtec Direct Drive System, which has the same indications as the Vibrant device. After describing the device's operation, Dr. Mann noted that since the last panel meeting, FDA had approved a cochlear implant device from MED-EL and an auditory brainstem implant from Cochlear Corporation.

Dr. Mann concluded by reading the statement FDA issued concerning meningitis in cochlear implant recipients. He referred meeting attendees to the FDA website for further information: http://www.fda.gov/cdrh/safety/cochlear.html.

FDA Presentation

Teri M. Cygnarowicz, M.A., CCC-A, Audiologist, Ear, Nose and Throat Devices Branch, summarized current scientific knowledge about and clinical experience with IMEHDs. She provided background on the development of the guidance document for IMEHDs, which was based on discussions from the June 1999 ENT panel meeting. She underscored the fact that guidance is *guidance;* as technology evolves, some guidance elements may be impossible, or a better way to answer a question may be developed. Manufacturers may deviate from the guidance, but they should provide justification; FDA tries to take least burdensome approach. Ms. Cygnarowicz noted that the guidance is available for public comment until September 12, 2002. FDA will consider the comments and finalize the document thereafter. FDA's concerns are reflected in the questions before the panel.

Ms. Cygnarowicz then read the questions before the panel and noted that specific panel members had been asked to lead the discussion for certain questions.

IMEHD DRAFT GUIDANCE FOR INDUSTRY AND FDA: PANEL DISCUSSION OF QUESTIONS

Question 1: What is the role of animal studies in the development of an IMEHD? When should preclinical animal studies be performed to support the safety and performance of an IMEHD?

Dr. Paul Kileny, lead panel responder, stated that the nature of the devices means that animal studies can help determine safety and effectiveness. Concerning safety, animal studies can help

to determine the biocompatibility of materials used to construct the device, to evaluate the issue of tissue remodeling in response to the device, to determine whether the devices are related to increased susceptibility to microorganisms and other pathogens, to examine the effects of surgical technique on the integrity of the conductive mechanism to help predict whether patients with implanted devices can transition back to conventional hearing aids, and to evaluate the risk of noise induced hearing loss from acoustic overstimulation at peak output levels. Concerning effectiveness, animal studies can help determine fatigue and wear properties, determine the long-term in vivo reliability of implanted components, evaluate maintenance issues concerning implanted microphones, compare different versions of the same design, and investigate effective coupling methods for retrofitting devices. Animal studies may be particularly important in examining the maintenance of the integrity of the conductive mechanism if a surgical approach differs from current approaches; if placement requires acute or chronic modification of the ossicular chain; and in designing and bringing to market totally implantable devices, particularly for issues related to battery life, integrity, replacement techniques, and transcutaneous recharging.

Panel members expressed support for and interest in certain contributions of animal studies in bringing to market IMEHDs, particularly studies on biocompatibility and maintenance of the device. It was suggested the laser vibrometry might be useful in evaluating gain and frequency response of devices implanted in animals. Some panel members suggested that studies using human temporal bones might be as effective as physiological measurements in animals. Panel members expressed concern over the comparability of ossicular chain motion across species; one cannot extrapolate from small mammals to humans. The panel concurred that surgical techniques are best worked out in human bone or cadaver models. Panel members noted

that biocompatibility is recognized with international standards; unless a device uses a novel material, such studies are not necessary.

Question 2: What additional assessments, if any, would you recommend be included in Section 5 (Investigational Device Exemptions) to evaluate the safety and effectiveness of the IMEHD?

- ***a) Currently there are several hearing aid fitting algorithms for conventional hearing aids, based on real-ear measurement techniques. These algorithms predict appropriate gain as a function of frequency for various patterns/magnitudes of hearing loss and hearing aid circuitry (e.g., linear vs. compression).***
  - ***(i) Should IMEHD manufacturers be responsible for developing similar fitting algorithms for their devices?***
  - ***(ii) If so, should there be common units of measurement among different manufacturers?***

Dr. Sigfrid Soli, lead panel responder, stated that he would like to rephrase some of the terminology in question as hearing aid fitting *targets,* not algorithms. Targets are expressed in terms of the amount of amplification (gain) for a patient once a hearing aid is fitted. Targets do not predict gain—they recommend gain. The terminology is important because the amount of gain, in terms of level and frequency, is important to users. As a result, the "short answer" to Question 2(a)(i), is yes, because of the evidence of targets' usefulness for air conduction hearing aids.

Dr. Soli stated that Question 2(a)(ii) is more difficult to answer. He would like to see some means by which we could know that when we deliver a signal to a transmitter, a certain amount of vibratory force or displacement is created (in the middle ear), which in turn could be related to hearing level; it would then be possible to develop common units. Such information would be useful to clinicians. Device output has to be expressed in meaningful units and related to patients.

The panel concurred that fitting targets are relevant because of the population for whom the devices are indicated and that it is important for manufacturers to develop those targets. The

panel raised issues involving device safety should such targets not be set. Development of common units of measurement should be an objective. The panel discussed the role of functional gain measurements; participants agreed that such measurements are useful but cannot be made independent of patients. Telemetry might offer more accurate measures of hearing change. Panel members also expressed concern about creating undue burden for manufacturers, but the panel concurred that development of a standardized output measurement would be of benefit to both manufacturers and clinicians; it was suggested that the industrial community could develop the measure as a team.

Question 2(b): What control condition(s) should studies with an IMEHD include? Should it be "state-of-the-art" acoustic hearing aids? If so, how does one define "state-of-the-art" or "optimally fit" if they are to be utilized in the controls? Should the condition include a comparison to the "best aided" condition, including binaural amplification?

The panel concurred that the experimental design and, therefore, the control conditions will depend on the purpose of the device. Some panel members believed that unaided control conditions are just as important as amplified control conditions. Some combination of performance and QOL measures may be appropriate. The panel also suggested that the term "state of the art" should be avoided in the guidance because the state of the art changes all the time; rather, terms like "best fit" should be used. Safety is paramount.

The panel spent some time discussing whether the guidance should require that patients use hearing aids before receiving implants. Several panel members stated that an appropriate comparison would be improvement over a patient's unaided condition rather than best aided condition. Other panel members thought that it was important to be able to give patients some idea of what to expect with the IMEHD compared to conventional hearing aids. Because implants put patients at some surgical risk and may cause more hearing loss than patients had to begin with, some panel members though that clinical trials should use the best binaural aided

condition as the comparison. Ultimately, the panel concurred that trials must consider baseline measures that include both unaided and aided monaural and binaural hearing. Dr. Blumenstein noted that studies could be designed to focus on noninferiority: Instead of showing that a device is superior, the goal would be to show that the outcome is not worse than the preintervention situation.

Question 2(c): Previous clinical studies with the two approved IMEHDs showed enhanced patient satisfaction with these devices despite the fact that objective hearing assessment results were similar to those using conventional hearing aids. What additional assessments, if any, could be used to demonstrate an enhancement in hearing performance to account for a subjective improvement in patient satisfaction?

Panel members stated that a few well-accepted instruments, such as the Health Utility Index, measure quality of life (QOL). Quality of Life instruments look at patients' perception of the effect of the hearing aid and allow researchers to see how a population values a particular outcome for a particular intervention. A questionnaire may not look at specifics of a particular population, such as occlusion or the ability to swim. A standard QOL assessment could be of benefit as an adjunct, but it should not be given as much weight as objective measures . Panel members noted that patient expectations play an important role in patient satisfaction.

The panel concurred that having some measurement of intangibles beyond hearing improvement was useful but that such measures should not preclude looking at other auditory effects, such as resonance of the ear canal.

Question 3: Conventional hearing aid labeling includes performance characteristics based on standardized measurement methodology (i.e., American National Standards Institute (ANSI) S3.22, 1996). Given the different types of implantable middle-ear hearing devices (e.g., semi- vs. totally-implantable; electromagnetic vs. piezoelectric), what, if any performance characteristics can be shared among these different device types? What performance characteristics would you want to standardize and include in device labeling (APPENDIX B) common to all IMEHD devices?

Dr. Donald Eddington, lead panel responder, stated that many years of experience are behind specifying hearing aids, much of which is reflected in ANSI standards. Two steps are required in developing performance characteristics for IMHEDs. First, even though IMEHD outputs are different from those of acoustic hearing aids, they need to be related to conventional hearing aid output. Given the current state of knowledge, it should not be difficult to develop a simulation of IMEHD load on the systems to which those devices connect. Second, input has to be taken into account; it can be specified in terms of acoustic input and be directly compared with hearing aids. The specification standards that have already been developed for hearing aids should be used. This approach will provide comfort for clinicians because they know what that information means and can use it to fit devices. We should take advantage of the tools we have and specify the device in a way that makes sense, is a complete specification, and provides consistent units across devices.

Panel members concurred that audiologists would appreciate consistent specifications. They also agreed with the concept of developing a model for characterizing output and suggested that the development process could be an industrywide or academically led effort. Industry has an obligation to convey information in a way audiologists can understand, but a 1:1 comparison to state-of-the-art acoustic hearing aids is not possible. The output needs to be characterized if the goal is to match current hearing aid standards; to make an analogy between current prescriptive methods for hearing aid fitting, we need the ability to telemetrically measure output when the device has been placed.

Dr. Whipple noted that collaboration between FDA, National Institute of Science and Technology, and manufacturers was possible.

OPEN PUBLIC HEARING

Deborah Arthur, Vice president, Regulatory and Clinical affairs, Symphonix, said that her company has found that patients who receive implants will never have their expectations met unless they have experience with an appropriately fitted conventional device. Audiologists are confused because of the lack of standardization; the panel's recommendations in that area are excellent.

Dr. Whipple outlined the next steps in the guidance development process and said that the guidance should be finalized by the end of the year.

Ms. Thornton noted that the October 17–18, 2002 panel meeting has been canceled; the panel is tentatively scheduled to meet again on December 13, 2002.

ADJOURNMENT

Dr. Gulya thanked the FDA presenters and adjourned the closed session at 3:55 p.m.

I certify that I attended this open session of the Ear, Nose and Throat Devices Advisory Panel on August 16, 2002, and that these minutes accurately reflect what transpired.

Sara M. Thornton
Executive Secretary

I approve the minutes of the August 16, 2002, open session as recorded in this summary.

A. Julianna Gulya, M.D.
Chairperson

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